

## Amendment and Response

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Serial No.: 09/888,732

Confirmation No.: 2092

Filed: 25 June 2001

For: UNIDIRECTIONAL RESPIRATOR VALVE (As Amended)

- Sub B1*  
*a1*
1. (Once Amended) A unidirectional valve comprising:  
a valve body including a frame, a valve opening through the frame, and a valve seat extending from the frame and at least partially surrounding the valve opening; and  
a valve flap having a first portion attached to the frame and an adjacent second portion free to move from a first position where the second portion is in contact with at least a part of the valve seat to a second position where at least part of the second portion is spaced from the valve seat, wherein the second portion of the valve flap comprises a first side spaced from a second side and a first end proximate the first portion and a second end spaced from the first end, wherein the valve flap thickness varies between the first and second sides, and further wherein the valve flap thickness decreases when moving from the first end to the second end or from the second end to the first end.

- Sub B1*  
*a2*
3. (Once Amended) The unidirectional valve of claim 1, wherein the valve flap has a minimum thickness and a maximum thickness between the first and second sides, and wherein the maximum thickness is at least about 10% greater than the minimum thickness.

- Sub B1*  
*a3*
7. (Once Amended) The unidirectional valve of claim 6, wherein the at least one rib provides the valve flap thickness variations between the first and second sides.

- Sub B1*  
*a4*
18. (Once Amended) A respirator having a unidirectional valve, comprising:  
a face mask having at least one opening for receiving a unidirectional valve; and  
a unidirectional valve comprising:  
a valve body including a frame, a valve opening through the frame, and a valve seat extending from the frame and at least partially surrounding the valve opening; and  
a valve flap having a first portion attached to the frame and an adjacent second portion free to move from a first position where the second portion is in contact with at least a part of the valve seat to a second position where at least part of the second

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a4

portion is spaced from the valve seat, wherein the second portion of the valve flap comprises a first side spaced from a second side and a first end proximate the first portion and a second end spaced from the first end, wherein the valve flap thickness varies between the first and second sides, and further wherein the valve flap thickness decreases when moving from the first end to the second end or from the second end to the first end.

Sub B1

22. (New) A unidirectional valve comprising:

a valve body including a frame, a valve opening through the frame, and a valve seat extending from the frame and at least partially surrounding the valve opening; and

a valve flap having a first portion attached to the frame and an adjacent second portion free to move from a first position where the second portion is in contact with at least a part of the valve seat to a second position where at least part of the second portion is spaced from the valve seat, wherein the valve flap has a nonuniform thickness and a stiffness to mass ratio;

a5

wherein the valve flap has the same perimeter, shape, and attachment means as a second valve flap having a uniform thickness, wherein the stiffness to mass ratio of the valve flap is higher than the stiffness to mass ratio of the second valve flap.

23. (New) The unidirectional valve of claim 22, wherein the valve flap comprises a first side spaced from a second side, and further wherein the valve flap thickness varies between the first side and the second side.

24. (New) The unidirectional valve of claim 23, wherein the valve flap has a minimum thickness and a maximum thickness between the first and second sides, and wherein the maximum thickness is at least about 10% greater than the minimum thickness.

25. (New) The unidirectional valve of claim 22, wherein the second portion of the valve flap comprises a first end proximate the first portion and a second end spaced from the first end, and

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further wherein the valve flap thickness decreases when moving from the first end to the second end or from the second end to the first end.

26. (New) The unidirectional valve of claim 22, wherein the valve seat is generally planar and the valve flap has curvature that causes a bias of the valve flap toward the valve seat to provide a seal between the valve flap and the valve seat.

27. (New) The unidirectional valve of claim 26, wherein at least a portion of the curvature of the valve flap is at least partially flattened when the valve flap contacts the valve seat.

28. (New) The unidirectional valve of claim 26, wherein the bias of the valve flap toward the valve seat is sufficient to provide a seal between the valve flap and the valve seat in any orientation of the unidirectional valve.

29. (New) The unidirectional valve of claim 22, wherein the valve flap has a bottom surface that is generally planar and wherein the valve seat is generally nonplanar.

30. (New) The unidirectional valve of claim 22, wherein the frame of the valve body comprises an angled portion adjacent the valve seat.

31. (New) The unidirectional valve of claim 22, wherein the valve is an exhalation valve.

32. (New) The unidirectional valve of claim 22, wherein the valve is an inhalation valve.

33. (New) The unidirectional valve of claim 22, wherein the valve flap is removably attached to the valve body.

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34. (New) A unidirectional valve comprising:
- a valve body including a frame, a valve opening through the frame, and a valve seat extending from the frame and at least partially surrounding the valve opening; and
  - a valve flap having a first portion attached to the frame and an adjacent second portion free to move from a first position where the second portion is in contact with at least a part of the valve seat to a second position where at least part of the second portion is spaced from the valve seat, wherein the second portion of the valve flap comprises a first end proximate the first portion, a second end spaced from the first end, a top surface, a bottom surface, and at least one rib extending from the top surface of the valve flap for at least a part of the distance from the first end to the second end.
35. (New) The unidirectional valve of claim 34, wherein the valve flap thickness decreases when moving from the first end to the second end or from the second end to the first end.
- as 36. (New) The unidirectional valve of claim 34, wherein the at least one rib comprises a plurality of ribs, wherein each of the plurality of ribs is spaced from each adjacent rib.
37. (New) The unidirectional valve of claim 34, wherein the at least one rib extends from the first end to the second end.
38. (New) A respirator having a unidirectional valve, comprising:
- a face mask having at least one opening for receiving a unidirectional valve; and
  - a unidirectional valve comprising:
    - a valve body including a frame, a valve opening through the frame, and a valve seat extending from the frame and at least partially surrounding the valve opening; and
    - a valve flap having a first portion attached to the frame and an adjacent second portion free to move from a first position where the second portion is in contact with

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at least a part of the valve seat to a second position where at least part of the second portion is spaced from the valve seat, wherein the second portion of the valve flap comprises a first end proximate the first portion, a second end spaced from the first end, a top surface, a bottom surface, and at least one rib extending from the top surface for at least a part of the distance from the first end to the second end.

- as
39. (New) The respirator of claim 38, wherein the valve flap thickness decreases when moving from the first end to the second end or from the second end to the first end.
40. (New) The respirator of claim 38, wherein the face mask is formed of a filtering material.
41. (New) The respirator of claim 38, wherein the unidirectional valve is an exhalation valve.
42. (New) The respirator of claim 38, wherein the unidirectional valve is an inhalation valve.

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